Description Haptics-enabled robotic and telerobotic systems play a central role in several industries, such as those using exoskeletons and robots for assembly (e.g., the automotive industry) where humans and robots may physically interact on production lines. Another industry that requires particular knowledge about physical human-robot interaction is medical robotic industries. Numerous medical device companies (e.g., Stryker, Verb Surgical, Intuitive Surgical, BioniK Labs, Hocoma) are centered around robotic systems since they can revolutionize medical practice and healthcare. The course teaches theoretical and experimental/simulation skills focusing on physical human-robot interaction, haptics, and telerobotics. No prior knowledge in robotics is needed. Students will learn about haptics, robotics, control, and signal processing techniques related to physical human-robot interaction, haptics rendering, and internet-based telerobotics. The practical focus of the course will be on medical applications, specifically surgical robotics, and neuro-rehabilitative robotics. Students will also become familiar with existing medical robotic technologies. The performance, stability, safety, and synchronization of robotic systems will be discussed.

Topics Covered
1. Physical Human-Robot Interaction and Haptics
2. Application in Surgical Domain (telerobotic surgery, capsular robotics, hand-held robotics)
3. Application in Neurehabilitation Domain (assistive robots, active prosthetic and exoskeletons)
4. Motion and Force Conditioning for Interaction
5. Telerobotic Architectures
6. Internet-based Telerobotics (latency, jitter, packet loss)
7. Impedance and Admittance Control of Interactive Robotic Systems
9. Simulation of Telerobotic Systems in Matlab

Prerequisites CS-UY 1114, MA-UY 2034 and PH-UY 1013 or equivalents (see Minor in Robotics)

Schedule
Class: Monday and Wednesday 3:30 to 4:50pm
Laboratory (4 options): Monday, Tuesday, Wednesday or Thursday: 5-6:50pm

Contact
Prof. S. Farokh Atashzar
Office: 5 MetroTech Center #266D Brooklyn, NY 11201
Email: f.atashzar@nyu.edu